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COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF BIOMEDICAL AND LABORATORY SCIENCES

DEPARTMENT OF MEDICAL PARASITOLOGY

INTESTINAL SCHISTOSOMIASIS, SOIL TRANSMITTED HELMINTHIASIS AND ASSOCIATED RISK FACTORS AMONG PRESCHOOL AGED CHILDREN OF CHUAHIT AND SURROUNDING KEBELES, NORTHWEST ETHIOPIA

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ACRONYMS

DALYS	Disability Adjusted Life Years
EPG	Eggs per Gram of Stool
HEW	Health Extension Workers
MDA	Mass Drug Administration
NTD	Neglected Tropical Disease
PSAC	Preschool School Aged Children
PZQ	Praziquantel
SAC	School Aged Children
WHA	World Health Assembly
WHO	World Health Organization

ABSTRACT

Background: Intestinal schistosomiasis and soil transmitted helminthiasis are the major public health problems in many parts of the world. Compared with any other age group, pre-school aged children and school-aged children are the most exposed. There are few studies which show the burden of intestinal schistosomiasis and soil transmitted helminthes among pre-school aged children in other part of Ethiopia.

Objective: The objective of this study is to assess the prevalence of *scistosoma mansoni* and soil transmitted helminths and associated risk factors among preschool aged children of Chuahit and surrounding Kebeles, North west Ethiopia.

Method: community based cross sectional study was conducted from February to March, 2015. A total of 401 preschool aged children were included in this study by using two stage cluster sampling technique. Data was collected by pretested and semi structured questionnaire using interview technique by health extension workers. A single stool specimen was collected and a portion of the sample was processed by Kato Katz method.

Results: Among 401 pre school age children examined using single Kato-Katz method, 141 (35.2%) had one or more intestinal helminthes. *S. mansoni* was also isolated in 45 (11.2%) of PSAC. *A. lumbricoides* was the predominant isolate 77 (19.2%) followed by *S. mansoni* 45 (11.2%) with the least of *Tania species* 2 (0.5%). Significant association was observed between prevalence of STH and mothers of PSAC being house wife (AOR = 8.9, 95% CI = 2.27 – 34, P = 0.037), PSAC who do not have a habit of washing hands after toilet (AOR = 7.34, 95% CI = 2.9 – 18, P = 0.00) and family's main source of water (AOR = 3.9, 95%CI = 1.2- 12.3, P = 0.02). Significant association was also observed between prevalence of *S. masoni* and those PSAC who have been washed by their mothers in river (AOR = 17, 95%CI = 5.14,63, p- value = 0.00) and those PSAC who see blood in their stool (AOR = 2.169, 95% CI = 1.043, 4.3, p- value = 0.038).

Conclusion: The current study showed that relatively higher level of STH and *S. mansoni* among PSAC of Chuahit and surrounding Kebeles. Mothers of PSAC in the study area had limited knowledge on ways of transmission and preventive methods of STH and *S. mansoni*.

Key words: *Schistosoma mansoni,* soil transmitted helminthes, preschool aged children, North West Ethiopia, associated risk factors.

1. INTRODUCTION

1.1.Background

Intestinal schistosomiasis and soil transmitted helminthiasis are the major medical and public health problems in many parts of the world, about 3.8 billon people are infected globally with soil transmitted helminths(STH) that is 1.45 billion with *Ascaris lumbricoides*, 1.3 billion with hookworm and 1.05 billion with *Trichuris trichiura* (1).

Schistosomiasis is a chronic neglected tropical parasitic (NTD) disease in which 700 million people are at risk in 74 countries, and affecting around 240 million people worldwide. Schistosomiasis ranks second to malaria as the most common parasitic disease, and are the most fatal NTD, it affects poor rural communities with limited access to basic sanitation and clean water (2). *S. mansoni* is most common in Africa, the Eastern-Mediterranean, the Caribbean, and South America(3). The occurrence of both intestinal Schistosomiasis and soil-transmitted helminthiasis are closely related to the condition of poverty, both parasitic infections are prevalent where there is poor hygiene, and lack of safe water and adequate sanitation(4).

Recognizing the public health impact of schistosomiasis and soil-transmitted helminthiasis, the World Health Organization (WHO) has set a minimum target for the control of morbidity due to these parasitic worm infections, urging member states to regularly treat at least 75% and up to 100%, of all school-aged children(SAC) at risk of morbidity(1).

Control of STH and intestinal Schistosomiasis , are based on regular antihelminthic and praziquantel treatment, health education and improved sanitation standards and development of a control strategy based on population intervention are better than individual treatment and environmental measures like snail control in area where there is Schistosomiasis should be recommended (5). In developing countries, however, control measures are difficult to implement due to clear water, sanitation and education problems. As a result, intestinal helminths infection remains a significant health problem in these regions (6).

Ethiopia has one of the lowest quality drinking water supply and latrine coverage in the world (6, 7). As a result Schistosomiasis and STH are endemic in many parts of Ethiopia and the intestinal form of schisosomiasis caused by *S. mansoni* is more widely distributed in the country compared

to the urinary form caused by *S. hamatobium* which limited to some lowland areas of Ethiopia(8).

The life cycle of schistosoma parasites is completed in two different hosts i.e. humans and freshwater snails. aquatic biomphalaria, bulinus and Amphibious Oncomelania snails are the intermediate hosts of *S. mansoni* ,*S. haematobium* and *S. japonicum* respectively, *schistosoma* parasites multiply in snail intermediate hosts and humans that come into contact with fresh water that contains these snails are at risk for infection (9). The main factors for the distribution, transmission, and spreading of Schistosoma species include water, temperature, absence or presence of snail intermediate host, population movement, and water impoundment for irrigation and power(10).

1.2.Statement of the problem

Morbidity caused by *S. mansoni* and STH is commonly associated with heavy infection intensities and Compared with any other age group, pre-school children(PSAC) and school-aged children(SAC) are the most exposed group and they harbor the greatest numbers of intestinal worms (11, 12). Which results in diarrhea, loss of appetite, weight loss, growth retardation, malnutrition , anemia, cognitive defects and hepatosplenomegaly in chronic cases which may lead to sever heath problem and mortality later in life (13).

The harmful result of STH infection on iron status and nutrition in PSAC with light infections may be related to an inflammatory-triggered cytokine reaction in naive children, and a consequent suppression of protein metabolism, appetite and erythropoiesis, and to both iron and micronutrient loss (14). According to the report of WHO around 135 thousand people are died annually due to STH worldwide, *Ascaris lumbricoides* caused annual mortality of 60,000 people, *Trichuris trichiura* 10,000 and hook worm caused annual mortality of 65,000 (15).

The extent of mortality caused by schistosomiasis remains uncertain however Using cause-specific reports WHO estimated that 41 000 people die each year and Analysis of data from sub-Saharan Africa were used to estimate that mortality could be as high as 280 000 per year in the African region alone in which more than 90% of the cases occur (16). WHO report of 2004, estimated that morbidity caused an equivalent of 1.7 million disability adjusted life years (DALYs)(17).

Schistosomiasis in African PSAC has been previously unnoticed but much better recognized in recent years. Although increasing evidence showing that treatment with praziquantel is safe, beneficial, and could be delivered within ongoing public health interventions, PSAC do not have satisfactory access to this drug, and there is a treatment gap (18, 19). Most mass drug administration (MDA) campaigns have been implemented in sub-Saharan Africa treating millions of SAC for schistosomiasis with praziquantel (PZQ). But PSAC (≤7 years) have been every time excluded from access to such kind of medication (20). The reason behind is the belief that PSAC would not yet been exposed to infested freshwater bodies, thus an insufficient understanding and documentation of the extent and severity of schistosomiasis in this age class (21). Current studies show that the prevalence of schistosome infections is high among PSAC whose parents have high levels of contact with water (19, 22).

Studies which were conducted in Mali, Niger, Sudan, Uganda and Zimbabwe showed that PSAC are at high risk of schistosomiasis and prevalence of the infection ranged from 18% to 63% which implies that PSAC were at high-risk in areas endemic for schistosomiasis (23).

In Ethiopia, 5.01 million are infected with schistosomiasis and 37.5 million to be at risk and the intensity of infection related with severity of infection, which varies from locality to locality and estimated number of peoples in Ethiopia infected with STH were 11 million,26 million and 21 million with *hookworm*, *A. lumbricoides* and *T. trichiura* respectively (24). Study done in Ethiopia at Sheshe Kebele the prevalence of *T. trichiura*, *S. mansoni*, *A. lumbricoides*, *Hymenolepis nana*, and hookworm infections were 74.7%, 37.2%, 25.7%, 4.5%, and 5.9%, respectively , and at Wonji shoa sugar Estate the prevalence of *T. trichiura*, *S. mansoni*, *A. lumbricoides*, *Hymenolepis nana*, and *hookworm* infections were 2.9%, 8.8%, 4.6% , 10.4% , 0.8% respectively but there is no a study which is conducted in Amhara region even if there are many endemic areas for schistosomiasis (25).

The importance of the current study is, this study is preliminary in which most of studies conducted in Ethiopia were done among SAC but in this study the prevalence and the contribution of different risk factors for *S. mansoni* and STH infection will be specifically determined among PSAC.

1.3. Literature Review

Three cross-sectional surveys which were conducted in different areas of Sierra Leone among PSAC showed that the overall prevalence and intensity of *S. mansoni* was 11.2% and 33.5 EPG. Overall prevalence of STH infections were low, with hookworm 22.8%, *Ascaris lumbricoides* 17.2%, and *Trichuris trichiura* 2.6% in three surveys (26).

A cross sectional study carried out in south Cote d'Ivoire showed that the prevalence of *S.mansoni* among PSAC were: 25.5% in Azaguie´ Makouguie´ and 21.6% in Azaguie´ M'Brome´. And lower prevalence's of STH were found in Azaguie´ Makouguie´ compared with Azaguie´ M'Brome´ (*T. trichiura* : 0.4% versus 10.0%; *A. lumbricoides* :1.6% versus 3.1%; *hookworm*: 11.6% versus 16.6%) and among mothers interviewed for their children care and water use practice who involved in subsistence farming were 70% in Azaguie´ Makouguie´ and 48.4% in Azaguie´ M'Brome´, Mother involved in local trade (27.5 %, 31.1 %), Mother with main activity strongly linked to water (27.5%, 19.7%) , Knows about schistosomiasis (23.8%,36.9%), Knows about the place where one becomes infected (21.3, 32.0), Main source of drinking water: traditional well(97.5%, 83.6%) the percentage in bracket indicates that mothers response in Azaguie´ Makouguie and Azaguie´ M'Brome respectively) (27).

Interestingly a community-based survey conducted at Okyereko, a village in the Central Region of Ghana, among 97 children aged 2 months to 5 years involved in the study, Stool analysis revealed no *S. mansoni* eggs and the prevalence of hookworm is 3.1% but there were no other intestinal helminthes identified. And 89 mothers (91.8%) provided information about their PSAC water contact activities among all 26 of 89 (29.2%) had direct contact with water at any of three sources (river, irrigation dam and irrigation canal). Water contact involved playing in the irrigation canals, swimming and bathing in the irrigation dam and fetching water from the river. Children involved in washing were five of 26 (19.2%) ,fetching 15 of 26 (57.7%) and bathing/swimming 18 of 26 (69.2%) (28).

A cross-sectional epidemiological study conducted among PSAC in Diambala and Falmado, in the Western Sahel zone of Niger, showed that the prevalence of *S. mansoni* was 43.8%. Light infection was presented in 17.3% of the children, 23.8% moderate infections whereas 2.7% of the children were heavily infected. And among 147 mothers interviewed to assess knowledge and awareness about schistosomiasis, 142 know a place where one became infected, 135 know

that schistosomiasis is a water related disease and 140 know at least one symptom of schistosomiasis. The availability of latrine in the household was low (18.9%) (21).

A cross sectional study conducted in Malawi among PSAC and their mothers by serological and parasitological diagnosis as supplemented with urine antigen and questioner interview methods in total, 17.7% of PSAC and 45.1% of mothers having active schistosomiasis by parasitological and urine-antigen testing combined. The greater part of mothers had received little or no formal education; 44% of the mothers had never attended school, 53% had attended at primary level and just 3% having attended secondary education. Awareness of mother's about schistosomiasis was very poor, 97% of the women had little or no knowledge of the disease, 18% and 54% of mothers respectively would wash themselves or their clothes in environmental water. Up to 20% of PSAC were reported to be bathed at least once (60%) or twice (38%) in this potentially contaminated water each day (29).

An epidemiological survey of villages on the Ugandan shoreline of Lake Victoria, the assumed occurrence of intestinal schistosomiasis in the local infants was 7% and STH detected in the infants, *hookworm* 5.8% was by far the most common, with *T. trichiura*, *A. lumbricoides* and *H. nana* each detected at a prevalence of about 0.7%. A more level of mother-and-infant water contact, a higher abundance of (infected) Biomphalaria, and an unusual lakeshore topology may explain why *S.mansoni* infection was so much more common in the Bugoto subjects than in the Bwondha (19).

Another cross sectional study conducted in Uganda shoreline of Lake Victoria the overall *S. mansoni* prevalence was 39.3%. The geometric mean intensity of *S. mansoni* among the infected children was 273 EPG of feces (30)

A cross-sectional study which was conducted in Usoma, Western Kenya, stool positive for *S. mansoni* were 38(17.6%), and among PSAC who ever visit lake were 154(71.3%), swim in lake 73 (47.4%), wash clothes in lake 0, bath in lake 151 (98.0%), ever treated for schistosomiasis 0 (31).

A cross sectional study were conducted elsewhere in Ethiopia among under five children reported that the prevalence of *T. trichiura*, *S. mansoni*, *A. lumbricoides*, *Hymenolepis nana*, and *hookworm* infections were 74.7%, 37.2%, 25.7%, 4.5%, and 5.9%, respectively (32),

and at Wonji shoa sugar Estate the prevalence of *T. trichiura*, *S. mansoni*, *A. lumbricoides*, *Hymenolepis nana,* and *hookworm* infections were 2.9%, 8.8%, 4.6% , 10.4% , 0.8% respectively and 85.1% children were infected with one or more intestinal parasites (25) and among a total of 130 mothers who were interviewed 70.7% of the mothers respond that they do not know how children get *S. manson* (32).

Another cross sectional study conducted in Methara sugar state, central Ethiopia, and Jigga town, northwest Ethiopia among under five children showed that in the former the prevalence *S. mansoni , A. lumbricoides*, *T. trichiura* was 16%, 67% and 37% respectively and in the later the prevalence *S. mansoni , A. lumbricoides*, *T. trichiura* was 29%, 40%, and 12% respectively and in the former 89% of children were infected with one or more of 11 specious of parasites while in the later 82% were infected one or more of 12 specious of parasites(33).

A cross sectional study conducted in Tigray among under five children showed that prevalence of one or more intestinal parasites was 48.1%, *A. lumbricoides*(5.8%), *S. mansoni*(1%), and *E. vermicularis*(1%) (34).

1.4.Justification of the study

In the past PSAC, they are thought to be at low risk of schistosomiasis but now, there is increasing recognition that, in areas of high endemicity, preschool children's are at considerable risk of schistosomiasis. Current studies show that the prevalence of schistosome infections is high among PSAC whose parents have high levels of contact with water. By the time Mothers and other caregivers take children to water contact sites where both groups are exposed to infection. And some study shown that PSAC were being regularly bathed with fresh water drawn from the environmental, either at the water's source or near to it with bucket and at home, which indicate that PSAC are much more exposed to freshwater than earlier thinking which exposed them for early infection. More over children most of the time have a habit of playing on soil which may be faeclly contaminated that will exposed them for STH.

However by focusing treatment upon the school-aged population, World Health Assembly (WHA) resolution 54.19 neglects PSAC, thus preventing them from benefiting from the praziquantel treatment given to their older peers, and hence creating a potential health inequity in addition to this there is insufficient data documenting the safety and efficacy of praziquantel in PSAC(1).

Based on literature review there are few study's which show the burden of intestinal schistosomiasis and STH among PSAC in other part of Ethiopia. However, the prevalence of intestinal schistosomiasis and STH infection and risk factors for early childhood infection have not been investigated in this study area. To fill this gap, a cross-sectional study was designed to determine the prevalence and intensity of *S. mansoni* and STH infection among PSAC, including risk factors for early child infection. So that this study will provide a baseline information on the burden of *S. mansoni* and STH among PSAC for appropriate intervention measures.

2. OBJECTIVE OF THE STUDY

2.1.General objective

To assess Prevalence of *S.mansoni*, STH infection and associated risk factors among preschool aged children of Chuahit and surrounding Kebeles, Northwest Ethiopia

2.2.Specific objectives

- To determine prevalence of *S.mansoni* and STH among preschool aged children
- To determine intensity of infection in preschool aged children with *S. mansoni* and STH
- To identify associated risk factors with infection of *S. mansoni* and STH

3. MATEIALS AND METHODS

3.1.Study area and period

The study was conducted at Chuahit and surrounding Kebeles of Dembia District, North Gondar Zone. Chuahit is located 50 kms South of Gondar town and 789 km from Addis Ababa Northwest part of Ethiopia. There are eight rural and one town Kebles in Chuahit. Rivers which cross some Kebeles of Chuahit are Tanti kura ,Ambizina, Ambagenin and Chigero. An estimated total population of Chuhait is 45,426 and the average temperature and humidity is 28°C and 22% respectively, most of parents of preschool age children were farmers .The study was carried out between February –March 2015.

3.2.Study design

Community based cross-sectional study was carried out to assess the prevalence of *S.mansoni*, STH and associated risk factors among preschool aged children.

3.3.Population

3.3.1. Source population

All preschool aged children below the age of 7 year in Chuahit and surrounding Kebeles were source population.

3.3.2. Study population

All preschool aged children in randomly selected rural Kebeles (Darena and Meskele kerestoes) of chuahit were taken as study population.

3.4.Inclusion and Exclusion criteria

3.4.1. Inclusion criteria

Preschool aged children whose age is below 7 years and live in the study area.

3.4.2. Exclusion criteria

Children who take Praziquantel, antihelmintic drug in the past 4 weeks, children with diarrheic stool sample, those who are not volunteer to participate in the study and seriously ill children and PSAC less than 6 years were excluded.

3.5. Operational definition

Preschool aged children According to WHO 2010 report defined as children whose age is below 7 years

3.6.Variables of the study

3.6.1. Dependent variables

The prevalence and intensity of infection with *S. mansoni* and STH.

3.6.2. Independent variables

- Socio demographic characteristics of PSAC and their mothers
  - Age of children
  - Sex of children
  - Mother's Age
    - » Marital status
    - » Educational status
    - » Occupation

- Mother's Knowledge about *S. mansoni* and STH

- Practice of children and their Mothers
  - brought children to irrigation site or to the river
  - wash children directly in river
  - washing children in home with river water
  - main source of drinking water
  - children swimming in the river
  - Hand washing habit
  - Shoe wearing habit
  - Latrine utilization habit

3.7.Sample size determination

Required sample size was determined by using single population proportion formula. A prevalence of 15.5% was taken from similar study conducted in Wonji Shoa Sugar Estate, Ethiopia(25). And the level of confidence 95% so the minimum sample size calculated as.

$$n = \frac{Z_{\alpha/2}2\ P(\ 1-P)}{d^2}$$

$$n = \frac{(1.96)^2\ 0.155(\ 1-0.155)}{0.05^2}$$

n = 201

To avoid the design effect the required sample size was multiplied by 2

n = 402

3.8.Sampling technique

Two stage cluster sampling technique was utilized in this study. From the rural Kebles (clusters) under the administration of Chuahit and surrounding Kebeles (Darena and Meskele kerestoes) were selected by simple random sampling. Then study units were proportionally selected from each of the two Kebeles by systematic random sampling based on the calculated sample size.

3.9.Data collection and processing

3.9.1. Questionnaire survey

Data were collected by pretested and semi structured Amharic version questionnaire using interview technique. Health extension workers were recruited for data collection and supervised by the Principal Investigator. Before data collection, data collectors were assigned to each Kebeles. Then each data collector conducted a house-to house survey. During the survey, the data collectors first asked the mothers of PSAC whether or not any PSAC present or not in the household. When PSAC is found, the data collectors interviewed mothers or caretakers using the questionnaire after obtaining written informed consent. If the mothers or caretakers of PSAC were not present during the initial visit repeat visits was conducted for those individuals who were not available during the first visit. At each data collection spot, sufficient explanation about the aim of the research was given to the mothers or caretakers of PSAC before the interview.

3.9.2. Sample collection and laboratory procedures

A single stool specimen of about 5 gram was collected from PSAC in selected Kebeles of Chuahit. A clean dry and leak proof containers was used to collect a stool specimen and each container for every child were labeled with unique ID number and a portion of the sample was processed by Kato Katz method using a template holding 41.7 mg of stool (35). Other intestinal parasites investigated were also recorded separately and the intensity of infection with *S.mansoni* and STH were classified according to the guideline of WHO as Intensity of *S.mansoni* was classified into: light infection (1-99 epg), moderate (100-399 epg) and heavy (greater than 400 epg). Similarly, the classification for *A.lumbricoides*: light infection (1-4999 epg), moderate (5000-49999 epg) and heavy (greater than 50,000 epg); *T.trichiura*: light infection (1-999epg), moderate (1000-9999 epg) and heavy (greater than 10,000 epg) and for hookworm: light infection (1-1999epg), moderate (2000-3999 epg) and heavy (greater than 4,000 epg) (15).

3.9.3. Quality control

The reliability of the study findings were assured by implementing quality control measures during the whole process of the laboratory work (pre-analytical, analytical, and post-analytical quality control steps were followed). All materials, equipments and procedures were adequately controlled. Negative and positive control slides were used to check the functionality of microscope used during conducting the study. All slides were examined twice for confirmation of the result. From all of the slides, 15% were randomly selected and re-examined at the end by experienced laboratory technologist who was blind for the first examination result. Prior to administration, questionnaire was pre-tested with 10 mothers of PSAC at Kola Deba rural Keble.

3.10. Data management and analysis

All data were registered in laboratory logbook during the study period which was entered in to statistical package for social sciences (SPSS) statistical software version 20 for analysis. Then study findings were explained in words, tables and other statistical summary techniques. Binary logistic regression model was used to identify factor associated with infection of *S. mansoni* and STH. Multiple logistic regressions was fitted to control the possible effect of confounders and finally the variable which has independent association with dependent variable were identified on the basis of odd ratio (OR) with 95% confidence interval (CI) and *P-value* less than 0.05 and Proportions for categorical variables was computed using chi-square test.

3.11. Dissemination of the result

Results of this study will be disseminated through publication (local and or international journals), Presentation on annual scientific meetings, conferences and seminars. A copy of the result will be offered to University of Gondar College of Medicine and Health Science and Denbeya woreda heath office and will be given to heath posts and health centers of Chuahit. This is important to inform them on burden of *S.mansoni* and STH in this age group and they will take different intervention measures.

3.12. Ethical considerations

The study was conducted after ethical approval is obtained from research and ethics committee of the School of Biomedical and Laboratory sciences. Moreover, letter of support was secured from the Woreda health office and each Kebele administrations. In addition to that, following an explanation of the purpose, the benefits and the possible risks of the study, written consent was obtained from mothers of PSAC which assured that participation on voluntarily basis. And Children who were positive for *S. mansoni* and STH were treated by linking them with the health center of Chuahit.

4. RESULTS

4.1.Socio-demographic characteristics of study subjects

A total of 401 preschool aged children were included in the study. Out of 401 PSAC, 183(45.6%) of the respondents were males and 218 (54.4%) were females. The mean age of PSAC was 3.73 year and age ranges were between 6 month up to 6 years. The majority of mothers of PSAC were married, 374(93.3%); illiterate, 358 (89%) and farmer, 388(96.8%) (Table 1).

Table 1. Socio demographic characteristics of preschool aged children of Chuahit and surrounding Kebeles, Northwest Ethiopia , February to March, 2015.

Variables	Character	Frequency	Percentage
Sex	Male	183	45.6
	Female	218	54.4
Age	<1	49	12
	1.1-2.0	64	16
	2.1-3.0	83	20.7
	3.1-4.0	47	11.7
	4.1-5.0	67	16.7
	5.1-6.0	91	22.7
Marital status of mothers	Married	374	93.3
	Others	27	6.7
Educational status of mothers	Illiterate	358	89
	Read and write	16	4
	Primary school	27	6.7
Occupation of mothers	Farmer	388	96.8
	House wife	13	3.2

4.2.Prevalence of *S. mansoni* and STH

Among 401 PSAC examined using single Kato-Katz method, 141 (35.2%) had one or more intestinal helminthes. *S. mansoni* was isolated in 45 (11.2%) of PSAC. From soil transmitted helminths, *A. lumbricoides* was the predominant isolate 77 (19.2%) followed by hookworms 9 (2.2%) and *T. trichiura* 7(1.7%) with the least of *Tania species* 2 (0.5%).

Prevalence of one or more intestinal helminth infections showed significant association with age (p. value < 0.05). Difference in prevalence of intestinal helminth infection was not statistically significant between males and females. In this study, infections due to *S. mansoni*, Hookworm and *A. lumbricoides* appeared relatively higher in males than in females; whereas, more females than males were affected by and *T. trichiura* (Table2). The over prevalence of double parasitic infection was 16 (4%). No PSAC is co infected with three or more parasites. Co-infection rate was higher for *S. mansoni* and *A. lumbricoides* 5 (1.2%) followed by *S. mansoni* and *H. nana* 4(1%).There was no statistically significant association between double parasitic infection and sex and age. The prevalence of *S. mansoni* and *T. trichiura* increases with an increase in age: where as the prevalence of *A. lumbricoides* is highly prevalent in the age group1-3 years.

Table 2. Prevalence of intestinal helminths infections N (%) among PSAC of Chuahit and surrounding Kebeles, Northwest Ethiopia, February to March, 2015

Age	No	*S. m*	*H.w*	*T. t*	*A .l*	*E. v*	*H. n*	*T.s*	*Any. h*
≤ 1	49	2(4.1%)	0	0	4(8.2%)	0	2(4.2%)	0	8(16.3%)
1.1-2.0	64	6(9.4%)	1(1.6%)	1(1.6%)	16(25%)	0	3(4.7%)	0	24(37.5%)
2.1- 3.0	83	10(12%)	3(3.6%)	1(1.2%)	18(21.7%)	0	5(6%)	1(1.1%)	33(39.8%)
3.1-4.0	47	3(6.4%)	1(2.1%)	0	8(17%)	0	2(4.3%)	0	14(29.8%)
4.1-5.0	67	11(16.4%)	2(3%)	2(3%)	14(20.9%)	2(3%)	3(4.5%)	1(1.5%)	31(46.3%)
5.1-6.0	91	13(14.3%)	2(2.2%)	3(3.3%)	17(18.7%)	1(1.1%)	2(2.2%)	0	31(34.1%)
Total	401	45(11.2%)	9(2.2%)	7(1.7%)	77(19.2%)	3(0.7%)	17(4.2%)	2(0.5%)	141(35.2%)
x^2		6.561	2.142	3.736	5.849	6.498	1.630	3.425	12.817
P		0.255	0.829	0.588	0.321	0.261	0.898	0.635	0.025
Sex									
Female	218	22(10.1%)	3(1.4%)	6(2.8%)	41(18.8%)	1(0.5%)	8(3.7%)	1(0.5%)	74(33.9%)
Male	183	23(12.6%)	6(3.3%)	1(0.5%)	36(19.7%)	2(1.1%)	9(4.9%)	1(0.5%)	67(36.6%)
x^2		0.048	1.641	2.822	0.612	0.539	0.382	0.15	0.310
P		0.434	0.200	0.093	0.434	0.463	0.537	0.901	0.577

A.l = A. lumbricoides, H.w = hookworm, T.t = T. trichiura, S. m = S. mansoni, H. n = H. nana, E.v = E. vermicularis and Any.h = infection with one or more intestinal helmintes.

4.3. Intensity of *S. mansoni* and STH

In this study the mean egg per gram of *S. manosni* , *A. lumbricoides*, *Hookworm* and *T. trichiura* infections were 8.96 (Range: 24 to288), 2217(Range: 96 to118,800), 1.38(Range: 24, 144) and 7.48 (Range: 24, 2496) respectively.

Among 45 PSAC who were positive for *S. mansoni* 8% had light infection and 3.2% had moderate infection. Among 77 PSAC who were positive for *A. lumbricoides*, 10% had light intensity of infection, 7.7% had moderate intensity of infection and 1.5% had heavy infection. Except one PSAC who is moderately infected with *T. trichiur*, the intensity of *T. trichiura* and hookworm infections in all PSAC positive for the parasites was light (Table 3). No statistical significant association was observed in intensity of infection with *S. manosni* , *A. lumbricoides*, Hookworm and *T. trichiura* infections among the different age group and sex of PSAC.

Table 3. Intensity of *S. mansoni* and soil transmitted helminthiasis in PSAC of Chuahit and surrounding Kebeles, Northwest Ethiopia, February to March, 2015

Infection status	S. mansoni		A. lumbricoides		Hookworm		T. trichiura	
	No	%	No	%	No	%	No	%
No o/p seen	356	88.8	324	80.8	392	97.8	394	98.3
Light	32	8	40	10	9	2.2	**6**	**1.5**
Moderate	13	3.2	31	7.7	0	0	**1**	**0.2**
Heavy	0	0	6	1.5	0	0	0	0
Total	401	100	401	100	401	100	401	100

4.4.Risk factor analysis for soil transmitted helminthiasis

In the present study, no statistical significant association was observed in STH prevalence between sex, age, marital status and educational status of mothers of PSAC. Significant association was observed between prevalence of STH with occupation of mothers of PSAC, those mothers who are house wife found around nine times more likely their child to be infected with parasite than farmers (AOR = 8.9, 95% CI = 2.27 – 34, P = 0.037). And PSAC who do not have a habit of washing hands after toilet were found around seven times (AOR = 7.34, 95% CI = 2.9 – 18, P = 0.00) more likely to be infected with STH than those who do have a habit of washing hands after toilet. Statistical significant association was also observed between prevalence of STH and family's main source of water (AOR = 3.9, 95%CI =1.2 – 12.3, P= 0.02). Those mothers whose main source of water from protected spring found their child around four times more likely to be infected with STH than those whose main source of water were from well (Table 4).

Table 4. Risk factors for soil transmitted helminthiasis in PSAC of Chuahit and surrounding Kebeles, Northwest Ethiopia, February to March, 2015

Variable		Prevalence of STH				
Demographic variables	No(%)	Yes (%)	No (%)	COR(95%CI)	AOR(95%CI)	P. value
Sex						
Male	183(45.6%)	43(23.5%)	140(76.5%)	1.059(0.664-1.69)	1.00(0.6- 1.67)	0.994
Female	218(54.4%)	49(22.5%)	169(77.5%)	1		
Age						
< 1 yr	49(12.2%)	4(8.2%)	45(91.8%)	0.29(0.95--0.92)	0.39(0.12-1.27)	0.119
1.1-2.0	64(16%)	18(28.1%)	46(71.9%)	1.3(0.62-2.7)	1.45(0.65-3.22)	0.360
2.1-3.0	83(20.7%)	22(26.5%)	61(73.5%)	1.2(0.6-2.4)	1.38(0.65-2.9)	0.4
3.1-4.0	47(11.7%)	9(19.1%)	38(80.9%)	0.79(0.33-1.99)	0.8(0.32-2)	0.63
4.1-5.0	67(16.7%)	18(26.9%)	49(73.1%)	1.2(0.59-2.54)	1.24(0.56-2.74	0.596
5.1-6.0	91(22.7%)	21(23.1%)	70(76.9%)	1	1	
Marital status of mothers						
Married	374(93.3%)	86(23)	288(77%)	1.04(0.41-2.67)	1.1(0.34-3.14)	0.85
Divorced	27(6.7%)	6(22.2%)	21(77.8%)	1	1	
Educational status of mothers						
Illiterate	358(89.3%)	83(23.2%)	275(76.8%)	0.86(0.35-2.11)	0.855(0.31-2.38)	0.765
Read and write	16(4%)	2(12.5%)	14(87.5%)	0.4(0.07-2.26)	0.19(0.03-1.37)	0.1
Primary school	27(6.7%)	11(40.7%)	16(59.3%)	1	1	
Occupation of mothers						
Farmer	388(96.8%)	85(21.9%)	303(78.1%)	1	1	
House wife	13(3.2%)	7(53.8%)	6(46.2%)	4.2(1.4-12.7)	8.9(2.27-34)	0.002
Risk factors						
Source of water						
Protected spring	15(3.7%)	8(53.3%)	7(46.7%)	4.1(1.45-11.65)	3.9(1.2-12.3)	0.02
Well	386(96.3%)	122(31.6%)	264(68.4%)	1	1	
Hand washing habit after toilet						
Present	102(25.4%)	6(5.9%)	96(94.1%)	1	1	
Absent	299(74.6%)	86(28.8%)	213(71.2%)	6.46(2.73-18.3)	7.34(2.9-18)	0.00

In separate univariate analysis for prevalence of hookworm and PSAC who do not have shoe wearing habit significant positive associations were observed (OR = 12.917, 95% CI = 2.442 – 68.308, P = 0.003).

Risk factors associated with prevalence of *S. mansoni* on crude bivariate analysis were: bring children to river, washing children in river, washing children at home with freshly fetched water, swim in river, number of times swim per week, cross river with bare foot, distance of home from river and ever seen blood in children stool(Table 5).

However, regarding other characteristics like: sex, age group, marital status of mothers, educational status of mothers, and occupation of mothers and bring children to irrigation site did not show any association with prevalence of *S. mansoni*.

Table 5. Bivariate logistic regression of selected variables in relation to prevalence of *S. mansoni* among PSAC of Chuahit and surrounding Kebeles, Northwest Ethiopia, February to March, 2015

	Schistosoma mansoni prevalence			
Risk factors	Yes (%)	No (%)	COR	P. value
Bring children to river				
Yes 204(50.9%)	43(21.1%)	161(78.9%)	26(6.213-109.147	0.00
No 197(49.1%)	2(1%)	195(99%)	1	
Washing children in river				
Yes 192(47.9%)	42(21.9%)	150(78.1%)	19.227(5.84-63.2)	0.00
No 209(52.1%)	3(1.4%)	206(98.6%)	1	
Washing children at home with freshly fetched water				
Yes 204(50.9%)	43(21.1%)	161(78.9%)	26(6-109)	0.00
No 197(49.1%)	2(1%)	195(99%)	1	
Bring children to irrigation site				
Yes 7(1.7%)	1(14.3%)	6(85.7%)	1.326(0.156-11.27)	0.796
No 394(98.3%)	44(11.2%)	350(88.8%)	1	
Children swim in river				
Yes 104(25.9%)	21(20.2%)	83(79.8%)	2.878(1.52-5.431)	0.001
No 297(74.1%)	24(8.1%)	273(91.9%)	1	
How many times swim in per week				
0,295(73.6%)	24(8.1%)	271(91.9%)	1	
1-2, 49(12.2%)	9(18.4%)	40(81.6%)	2.541(1.102-5.85)	0.029
≥3, 57(14.2%)	12(21.1%)	45(78.9%)	3.011(1.406-6.45)	0.05
Children cross river with bar foot				
Yes 132(32.9%)	25(18.9%)	107(81.1%)	2.909(1.549-5.46)	0.001
No 269(67.1%)	20(7.4%)	249(92.6%)	1	
Distance of home from river				
< 1km 226(56.4%)	35(15.5%)	191(84.5%)	3.024(1.453-6.29)	0.003
>1km 175(43.6%)	10(5.7%)	165(94.3%)	1	
Seen blood in stool				
Yes 60(15%)	15(25%)	45(75%)	3.456(1.726-6.9)	0.00
No 341(85%)	30(8.8%)	311(91.2%)	1	

Mothers Habit of washing their children in river and those PSAC who observe blood in their stool found to be statistically significantly associated with prevalence of *S. mansoni* in multivariate logistic regression analysis.

Those PSAC who have been washed by their mothers in river found 17 times (AOR = 17, 95%CI = 5.14,63, p- value = 0.00) more likely to be positive for *S. masoni* than those who have not been washed by their mothers. And Those PSAC who see blood in their stool found almost 2 times (AOR = 2.169, 95% CI = 1.043, 4.3, p- value = 0.038) more likely to be positive for *S. mansoni* than those who didn't see blood in their stool (Table 6).

Table 6. Multivariate logistic regression of selected variables in relation to prevalence of *S. mansoni* among PSAC of Chuahit and surrounding Kebeles, Northwest Ethiopia, February to March, 2015

Variables	Prevalence of *S. mansoni*		AOR(95%CI)	P- value
	Yes (%)	No (%)		
Washing children in river				
Yes	42(21.9%)	150(78.1%)	17 (5.14- 63)	0.00
No	3(1.4%)	206(98.6%)	1	
Seen blood in stool				
Yes	15(25%)	45(75%)	2.169(1.043- 4.5)	0.038
No	30(8.8%)	311(91.2%)	1	

4.5. Mothers knowledge about *S. mansoni* and STH

From a total of 401 mothers of PSAC (aged 20 up to 52 years) interviewed, Majority of mothers were not heard of intestinal Schistosomiasis 324(80.8%) and STH 166(41.4%). From those mothers herd of this parasitic infection, their major source of information was from health professionals.

Interestingly, mothers of PSAC interviewed about ways of transmission of intestinal Schistosomiasis, 85% of mothers respond that it cannot be transmitted by swimming or bathing in the river, crossing river with bare foot, washing clothes in river and fishing in river.

Regarding preventive methods of intestinal Schistosomiasis, 380(94.8%) of mothers of PSAC didn't know ways of prevention of intestinal Schistosomiasis (Table 7).

Table 7. knowledge of mothers about *S. mansoni* who are living in Chuahit and surrounding Kebeles, Northwest Ethiopia, February to March, 2015

Variables	Number of respondent mothers (%)
Heard of intestinal Schistosomiasis	
Yes	77(19.2%
No	324(80.2%)
Source of information for *S. mansoni*	
Mass media	8(2%)
Magazine	1(0.2%)
Health professionals	58(14.5%)
Neighbors	6(1.5%)
Intestinal Schistosomiasis transmitted swimming or bathing in river	
Yes	61(15.2%)
No	340(84.8%)
Intestinal Schistosomiasis transmitted crossing river with bare foot	
Yes	57(14.2%)
No	344(85.8%)
Intestinal Schistosomiasis transmitted washing clothes in river	
Yes	57(14.2%)
No	344(85.8%)
Intestinal Schistosomiasis transmitted fishing in river	
Yes	57(14.2%)
No	344(85.8%)
Preventive methods intestinal Schistosomiasis	
Avoid swimming in river and visit health center for treatment	11(2.7%)
Visit health center for treatment	6(1.5%)
Avoid crossing river with bare foot and visit health center for treatment	4(1%)
Don't know	380(94.8%)
Symptom of intestinal Schistosomiasis	
Abdominal pain	12(3%)
Itching sensation of skin, nausea and abdominal pain	5(1.2%)
Diarrhea	7(1.7%)
Don't know	377(94%)

Among mothers of PSAC interviewed about ways of transmission STH 218(54.4%), 204(50.9%), 212(52.9%) responded that STH can be transmitted by eating with dirty hand, by not wearing shoes ,due to keeping finger nails long and dirty and not washing hands after toilet respectively. And Concerning preventive methods of STH, 108(26.9%0 of mothers respond that STH can be prevented by washing hands with soap before eating food and after toilet, keeping finger nails short and clean and drinking clean water, 37(9.2%) by drinking clean water, 20(5%) by keeping personal hygiene and rest of mothers 18(4.5%) respond that STH can be prevented by wearing shoes and treating infected individuals (Table 8).

Table 8. Knowledge of mothers about STH who are living in Chuahit and surrounding Kebeles, Northwest Ethiopia, February to March, 2015

Variables	Number of respondent mothers
Heard of STH	
Yes	235(58.6%)
No	166(41.4%)
Source of information	
Mass media	13(3.2%)
Health professionals	209(52.1%)
Magazine	2(0.5%)
Neighbors	9(2.2%)
School	2(0.5%)
STH transmitted eating with dirty hand	
Yes	218(54.4%)
No	183(45.6%)
STH transmitted not wearing shoes	
Yes	204(50.9%)
No	197(49.1%)
STH transmitted keeping finger nails long and dirty	
Yes	212(52.9%)
No	189(47.1%)
STH transmitted not washing hands after toilet	
Yes	212(52.9%
No	189(47.1%)
STH transmitted not washing hands before eating food	
Yes	217(54.1%)
No	184(45.9%)
STH can be transmitted drinking dirty water	
Yes	215(53.6%)
No	186(46.4%)
Preventive methods of STH	
Washing hands with soap before eating food and after toilet, keeping finger nails short and clean and drinking clean water	108(26.9%)
Drinking clean water	37(9.2%)
Keeping personal hygiene	20(5%)
Shoe wearing and treating infected individual	18(4.5%)
Do not know	218(54.4%)
Symptom of STH	
Abdominal pain and bloody diarrhea	48(12%)
Abdominal pain	19(4.7%)
Diarrhea, vomiting and abdominal pain	30(7.5%)
Diarrhea, adult in stool and abdominal pain	14(3.5%)
Abdominal pain, adult in stool, vomiting and nausea	23(5.7%)
Don't know	267(66.6%)

5. DISCUSSION

The prevalence of one or more helminth infection observed among the study participants was 141(35.2%). This finding is lower than study conducted in different area of Ethiopia namely; Methara (89%) (33), Wondo Genet (85.1%) (32), Tigray (48.1%) (34), but higher than a report from Wonji Shoa (15.5%) (25). In this study, infection with one or more helminth increases as age increase in agreement with studies conducted in Ethiopia and Kenya (25, 32,36).

In the present study the prevalence of *S. mansoni* and STH infections among PSAC was (11.2%) and (22.9%) respectively. The prevalence of *S. mansoni* infection in this study was in agreement with previous study carried out in Sierra Leone (11.2%) (26). A higher finding were reported from Ethiopia like Methara (29%) (33) and Wondo Genet (37.2%) (32) , Niger (43.8%) (21), Cote d'Ivoire (25%) (27), Kenya (17.6%) (31), Uganda (39.3%) (30). This might be due to difference in geographical area and water source and time of survey. This finding is higher than studies conducted in Tigray (1%) (34), Wonji Shoa (8.8%) (25), Ghana 0 (28) , Uganda (7%) (19). This might be due to difference in source of infection.

Among 45 PSAC who were positive for *S. mansoni* (8%, 3.3%) had light infection and moderate infection and no PSAC is heavily infected but a report from Niger (21) showed that 17.3%, 23.8%, 2.7%,of PSAC were light, moderate and heavily infected respectively this might be due to difference in time of exposure to source of infection.

No a statistically significant association between prevalence of *S. mansoni* and age of PSAC in the current study but statistically significant association was observed from a study conducted Wonji Shoa(25).

Relatively higher prevalence of *S. mansoni* infection in the present study is observed. This might be due the absence of preventive chemotherapy with praziquantel. Therefore including praziquantel treatment in the deworming program as per the WHO guidelines would be essential to decrease the burden of these diseases in this age group (23).

From STH *A. lumbricoides* (19.2%) was the predominant parasitic infection. This finding was in agreement with a report from Sierra Leone (17.2%) (26), but lower than similar report from Wondo Genet (25.7%) (32) and Methara (40%) (33) . However, this finding is higher than a study conducted in Wonji Shoa (4.6%) (25), Cote d'Ivoire (3.1%) (27), Uganda (0.7%) (19). The variation in prevalence of *A. lumbricoides* may be associated with water supply,

environmental sanitation and socioeconomic status. The prevalence of *T. trichiura* in the present study was (1.7%), which is much more lower than studies carried out in Methara (67%)(33) and Wondo Genet (74.7%) (32). This differences might be due to difference in time study, environmental sanitation, personal hygiene and climate condition.

Interestingly the Majority of mothers of PSAC were not heard of intestinal Schistosomiasis 324(80.8%) and STH 235(58.6%). Similar to the current study finding, a study conducted in Malawi the awareness of mother's about schistosomiasis was very poor, 97% of the women had little or no knowledge of the disease(29).

The present study revealed that those PSAC who have been washed by their mothers in river found 17 times (AOR = 17, 95%CI = 5.14,63, P-value = 0.00) more likely to be positive for *S. masoni* than those who have not been washed by their mothers in river. Another study conducted in Cote d'Ivoire showed that children staying at home with their elders found 2 times more likely to be positive for *S. mansoni* than those who were accompanying their mothers during daily livelihood activities (27). Both of this finding indicates PSAC are at higher risk of infection with *S. mansoni* however, by focusing treatment upon the school-aged population, World Health Assembly (WHA) resolution 54.19 neglects PSAC, thus preventing them from benefiting from the praziquantel treatment given to their older peers, and hence creating a potential health inequity (1).

In the present study the majority of the mothers of PSAC bring children to the river 204(50.9%) and washed them in the river. Majority of PSAC who accompanied their mothers were washed in the river 192(47.9%). This is in line with a study conducted in Niger (21). In Niger the majorities of mothers (76.3%) were accompanied by their children to the canal or the pond and washed them with the contaminated water.

6. CONCLUSION

The current study showed that relatively higher level of STH and *S. mansoni* among PSAC of Chuahit and surrounding Kebeles. Significant association was observed between prevalence of STH and occupation of mothers of PSAC, family main source of water and hand washing habit of PSAC after toilet. Risk factors associated with prevalence of *S. mansoni* on multivariate logistic regression analysis were: washing children in river and ever seen blood in children stool.

The study also revealed that mothers of PSAC in the study area had limited knowledge on ways of transmission symptom and preventive methods of STH and *S. mansoni*.

7. RECOMMENDATION

Based on this study the following recommendations are made

1. Relatively higher prevalence of *S. mansoni* was observed among PSAC therefore Administration of praziquantel should be included in ongoing public-health interventions such as the Expanded Programme on Immunization (EPI).
2. Washing children in the river is the major risk factor for PSAC to be infected with *S. mansoni*, therefore health education should be given to their mothers to decrease their exposure.
3. The finding of this study also showed that not hand washing habit of PSAC after toilet, using protected spring as main source of water and mothers of PSAC being house wife were major risk factors for infection with STH, so that health education should be given about the ways of transmission, prevention and control measures of this parasitic infection.

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9. ANNEXES

Annex I. Information sheet and consent form

Title of the Research project: the prevalence of intestinal schistosomiasis and STH and associated risk factors among preschool aged children in Chauhit district

Name of investigators: Yalewayker Tegene

Name the organization: University of Gondar College of Medicine and health sciences school of biomedical and Laboratory sciences.

Purpose of the study: to determine the prevalence of S. mansoni and STH associated risk factors among preschool aged children this will enable us to undertake appropriate intervention in this age group.

Procedure: laboratory investigations to diagnose *S. mansoni* and STH infections will be done.

Potential risks and discomforts: There is no anticipated risks to your participation simply you will give stool sample.

Potential benefits to subjects and/or community: The result of the study will be beneficial to know the burden of *S. mansoni* and STH among preschool aged children this will proved information for prevention and control of this parasite and to give priority how to treat intestinal schistosomiasis in this age group and those children who are infected with *S. mansoni* and STH will be treated .

Compensation for participation: You will not receive any payment for your participation in this study.

Confidentiality: Any information that is obtained in connection with this study and that can be identified with you will remain confidential. The information collected about you will be coded using numbers.

Participation and withdrawal: You can choose whether to be part of the study or not. You may withdraw at any time without consequences of any kind. You may also refuse children to give any sample and/or information.

Person to contact: If you have any question you can contact us at any time

Name : Yalewayker Tegegne phone number: 0913632072 email: tyalewayker@yahoo.com

Agersew Alemu phone number : 0918778244 email Agersewalemu@yahoo.com
Demekech Damite phone number: 0918776730

Study participants consent form

I the undersigned individual has been well informed about the objectives of the study entitled ‘’the prevalence of *S. mansoni* and STH and associated risk factors among preschool aged children ’’ I am also told that all information obtained at any course of the study is to be kept confidential. More over I have also been well informed of my right to keep hold of, decline to cooperate and drop out of the study if I want and none of my actions will have any bearing at all on my overall health care access.

Therefore, with full understanding of the situations I agree to give the entire necessary information and allow my child to give a stool sample for laboratory analysis.

Name……

Signature……

Amharic version of Information sheet and consent form

የመረጃና የስምምነት ቅፅ

የምርምሩ/ጥናቱ ርዕስ፡ በጫ,ይት ወረዳ ዕድሜያቸው ለትምህርት ያልደረሱ ህፃናት ላይ የብላርዚያ እና በአፈር የሚተላለፉ የሆድ ትሎች ስርጭትና ተጓዳኝ መንስኤዎቹ

የዋና ተመራማሪው ስም፡ ያለውአይቀር ተገኘ፣ ስልክ ቁጥር 0913632072

የድርጅቱ ስም፡ ጎንደር ዩንቨርሲቲ የባዮሜዲካል እና ላቦራቶሪ ሳይንስ ትምህርት ክፍል

የጥናቱ አላማ፡ በጫ,ይት ወረዳ ዕድሜያቸው ለትምህርት ያልደረሱ ህፃናት ላይ የብላርዚያ እና በአፈር የሚተላለፉ የሆድ ትሎች ስርጭትና ተጓዳኝ መንስኤዎቹን ለማወቅ

የጥናቱ ጉዳት

በዚህ ጥናት በሚሳተፉ ሰዎች ላይ የሚደርስ ምንም አይነት ጉዳት የለም፡፡

የጥናቱ ጥቅም

በዚህ ጥናት መሳተፍ ዋና ጥቅሙ ዕድሜያቸው ለትምህርት ባልደረሱ ህፃናት ላይ ያለው የቢላርዚያእና በአፈር የሚተላለፉ የሆድ ትሎች ስርጭት ለማወቅ ይረዳል በመሆኑም ይሄ መረጃ እነዚህ ተዋሲያን ለመከላከል እና ለመቆጣጠር ይረዳል ፡፡ እንዲሁም በሽታው የተገኘባቸው ህፃናት ተሎ ህክምና እንዲያገኙ ይደረጋል፡፡

ማካካሻ

በዚህ ጥናት በመሳተፈዎ የሚያገኙት ምንም አይነት የገንዘብ ክፍያ የለውም

ሚስጢር ስለመጠበቅ፡ በዚህ ጥናት ሲሳተፉ በጥናቱ የተገኜ ማንኛውም መረጃ በሚስጢርነት ይጠበቃል። ለዚህ ጥናት የሚሰበሰበዉ እርስዎን የሚመለከት መረጃ በማህደር የሚቀመጥ ሲሆን ማህአደሩም በእርሰዎ ስም ሳይሆን በተለየ ኮድ ሲቀመጥ ከዋናዉ ተመራመሪ በስተቀር ለማንም አይገለጽም።

በጥናቱ የመሣተፍ እና ያለመሳተፍ መብት፡ በዚህ ጥናት የመሣተፍም ያለመሣተፍ መብት አለወት። በፈለጉት ጊዜ ከጥናቱ ያለምንም ጉዳት የመዉጣት መብት አለወት እንዲሁም ልጆች ናሙና እንዳይሰጡ የማድረግ እና መረጃ ያለመስጠት መብት አለዎት

መረጃ ስለማገኜት፡ ማንኛውንም ጥያቄ ካለዎት እኛን በሚፈልጉት ጊዜ ማነጋገር ይችላሉ።

ስም ፡ ያለው አይቀር ተገኘ ስልክ ቁጥር ፡0913632072 ኢሚል፡ tyalewayker@yahoo.com

አገርሰዉ አለሙ ስልክ ቁጥር፡ 0918778244 ኢሚል፡Agersewalemu@yahoo.com

ደመቀች ዳምጤ ስልክ ቁጥር፡ 0918776730 ኢሚል

የዚህ ምርምር ተሳታፊ የመረጃ እና ስምምነት ቅጽ

ከዚህ በታች ፊርማየ የተቀመጠው የጥናቱ ተሳታፊ ስለዚህ ጥናት አላማ ተነገሮኝአል እንዲሁም በዚህ ጥናት ስሳተፍ በጥናቱ የተገኜ ማንኛውም መረጃ በሚስጢር ይጠበቃል በተጨማሪም በዚህ ጥናት ያለኝን ተሳትፎ በፈለኩት ጊዜ የማቃረጥ መብት አለኝ በማቃረጤም ማንኛዉንም የጤና አገልግሎት ከማግኜት አያግድኝም። በመሆኑም ከጥናቱ ጋር ያለውን ሁኔታ ስለተረዳሁኝ ማንኝዉንም አስፈላጊ መረጃ እንዲሁም ልጀ የሠገራ ናሙና እንዲሰጥ ተስማምቻለሁኝ።

ስም .....

ፊርማ.....

Annex II. Questionnaire

Code number ---------- Keble ---------- Date ----------

I. Questioner to assess socio demographic characteristics of preschool aged children

1. Sex 1. Male ☐ 2. Female ☐

2. Age …….. years

II. Questioner to assess socio demographic characteristics of mothers of preschool aged children

1. Age …… years

2. Marital status 1. Single ☐ 2. Married ☐ 3. Divorced/Separated ☐ 4. Widowed ☐

3. Educational status 1. Illiterate ☐ 2. Read and write ☐ 3. Primary school ☐ 4. Secondary school ☐ College

4. Religion 1. Orthodox ☐ 2. Muslim ☐ 3. Protestant ☐ 4. Others specify ☐

5. Occupation 1. Farmer ☐ 2. Merchant ☐ 3. House wife ☐ 4. Government employed ☐ 5. others specify_____

6. Ethnicity 1. Amhara 2. Tigrei 3. Others

III. Questioner to assess mothers knowledge about *S. mansoni* and STH

1. Have you ever heard of schistosomiasis

1. Yes ☐ 2. No ☐

2. If yes (Q.1) which source you get the information

1. Mass media ☐ 2. Magazine, book ☐

3. Health institution ☐ 4. From neighbors ☐

5. From school ☐ 6. Other specify _____

3. Schistosomiasis can be transmitted by swimming or bathing in river

1. Yes ☐ 2. No ☐

4. Schistosomiasis can be transmitted by crossing river bare foot

1. Yes ☐ 2. No ☐

5. Schistosomiasis can be transmitted while washing clothes or dishes in the river

   1. Yes ☐ 2. No ☐

6. Schistosomiasis can be transmitted while fishing in river

   1. Yes ☐ 2. No ☐

7. Schistosomiasis can be transmitted by eating with dirty hands

   1. Yes ☐ 2. No ☐

8. Schistosomiasis can be transmitted by drinking dirty water and eating unwashed fruit vegetables

   1. Yes ☐ 2. No ☐

9. What are preventive methods of Schistosomiasis.?

   1. Avoid swimming or bathing in river ☐
   2. Kill fresh water snails using chemicals ☐
   3. Visit heath center for treatment ☐
   4. Avoid crossing river bare foot ☐
   5. Crossing river in bridge ☐
   6. Other specify _____

10. What are symptom of schistosomiasis. _____

11. Have you ever heard of STH

    1. Yes ☐ 2. No ☐

12. If yes (Q.9) which source you get the information

    1. Mass media ☐ 3. Magazine, book ☐ 5. From school ☐
    2. Health institution ☐ 4. From neighbors ☐ 6. Other specify___

13. STH can be transmitted by eating with dirty hand

    1. Yes ☐ 2. No ☐

14. STH can be transmitted due to not wearing shoes

    1. Yes ☐ 2. No ☐

15. STH can be transmitted by keeping finger nails dirty and long

1. Yes ☐ 2. No ☐

16. STH can be transmitted by not washing hands after using toilet

    1. Yes ☐ 2. No ☐

17. STH can be transmitted by not washing hands before eating food

    1. Yes ☐ 2. No ☐

18. STH can be transmitted by drinking dirty water and eating unwashed fruit vegetables

    1. Yes ☐ 2. No ☐

19. What are preventive methods of STH

    1. Washing hands with soap before eating food ☐
    2. Washing fruits in clean water before eating ☐
    3. Washing hands with soap after toilet ☐
    4. Using toilets ☐
    5. Keeping finger nails short and clean ☐
    6. Drinking clean water ☐
    7. Other specify _____

20. What are symptoms of STH _____

IV. Questioner to assess mothers practice about *S. mansoni* and STH

1. Bring children to river

   1. Yes ☐ 2. No ☐

2. If yes (Q.1) did you Wash children in river

   1. Yes ☐ 2. No ☐

3. If yes (Q.1) did you Use soap while washing children

   1. Yes ☐ 2. No ☐

4. Washing children at home with freshly fetched water

   1. Yes ☐ 2. No ☐

5. Did you ever bring children to irrigation site

   1. Yes ☐ 2. No ☐

6. Did children swim in river

1. Yes ☐ 2. No ☐

7. If yes how many times swim per week

1. 0 ☐ 2. 1-2 ☐ 3. ≥ 3 ☐

8. Did children cross river with bare foot

1. Yes ☐ 2. No ☐

9. Distance of your home from rivers or any water body

1. < 1Km ☐ 2. > 1Km ☐

10. Availability of latrine in house hold

1. Yes ☐ 2. No ☐

11. If yes in number 10 do utilize Latrine

1. Yes ☐ 2. No ☐

12. Hand washing habit after toilet

1. Present ☐ 2. Absent ☐

13. Hand washing habit before eating food

1. Yes ☐ 2. No ☐

14. Presence of dirty material in finger nails

1. Yes ☐ 2. No ☐

15. Do your child have shoe

1. Yes ☐ 2. No ☐

16. If yes (Q. 13) Shoe wearing habit of your child

1. Always ☐ 2. Sometimes ☐ 3. Not at all ☐

15. Main source of water

1. Piped ☐ 2. Protected spring ☐ 3. Well ☐

16. Eating habit of unwashed fruits and vegetables

1. Yes ☐ 2. No ☐

17. Have you ever seen blood in children stool

1. Yes ☐ 2. No ☐

V. Questioner to assess mothers attitude about *S. mansoni* and STH

1. Schistosomiasis and STH are not preventable

1. Agree ☐ 2. Disagree ☐

2. Schistosomiasis and STH can be treated

1. Agree ☐ 2. Disagree ☐

3. If yes (Q.2) where did you take when children are sick due to Schistosomiasis and STH

1. Heath center ☐ 2. Traditional medicine centers ☐ 3. Health post ☐ 4. Hospital ☐

4. Schistosomiasis and STH more affect children

1. Agree ☐ 2. Disagree ☐

Amharic version of the questionnaires

ኮድ---------- ቀበሌ ---------- ቀን ----------

ከዚህ በታች ላሉት ጥያቄዎች መልስዎን ይስጡ

ክፍል አንድ ፡-ስለማህበራዊ ኢኮኖሚያዊና ስነህዝብ ሁኔታን ህጻናትን የሚመለከቱ ጥያቄዎች

1. ፆታ 1. ወንድ ☐ 2. ሴት ☐
2. እድሜ ……..

ክፍል ሁለት ፡-ስለማህበራዊ ኢኮኖሚያዊና ስነህዝብ ሁኔታን እናቶችን የሚመለከቱ ጥያቄዎች

1. ዕድሜ …….. አመት
2. የጋብቻ ሁኔታ 1. ያላገባች ☐ 2. ያገባች ☐ 3. የፈታች ☐ 4. የሞተባት ☐
3. የትምህርት ደረጃ 1. ያልተማረች ☐ 2. ማንበብ እና መጻፍ ☐ 3. የመጀመሪያ ደረጃ ☐ 4. ሁለተኛ ደረጃ ☐ 5. ኮሌጅ ☐
4. ሀይማኖት 1. ኦርቶዶክስ ☐ 2. ሙስሊም ☐ 3. ፕሮቴስታንት ☐ 4. ሌላ ካለ ይግለጹ ☐
5. የስራ ቅጥር ሁኔታ 1. አርሶ አደር ☐ 2. ነጋዴ ☐ 3. የቤት እመቤት ☐ 4. የመንግስት ተጣሪ ☐ 5. ሌላ ካለ ይግለጹ ☐
6. ጎሳ 1. አማራ 2. ትግሬ 3. ሌሎች

ክፍል ሦስት ፡- ብላርዚያን እና በአፈር የሚተላለፉ የሆድ ትላትሎችን የተመለከተ የእናቶችን እውቀት፣ የሚዳስስ ጥያቄ

ነ. ስለብላርዚያ ሰምተዉ ያዉቃሉ

1. አዉቃለዉ ☐ 2. አላዉቅም ☐

2. በተራ (ቁ.1) መልስዎ አዉቃለዉ ከሆነ መረጃዉን ከየት አገኙት

☐

1. ከመገናኛ ቡዙሀን 2. ከመፅሄት፣መጽሀፍ 3.ከጤና ተቁአማት 4. ከጎረቤት 5. ሌላ ካለ ይግለጹ

3. ብላርዚያ ወንዝ ላይ በመዋኜት እና በመታጠብ ሊይተላለፉ ይችላል.

1. ይተላለፉል 2. አይተላለፍም 3. አላዉቅም

4. ብላርዚያ ወንዝ በባዶ እግር በማቋረጥ ሊይተላለፉ ይችላል

1. ይተላለፉል 2. አይተላለፍም 3. አላዉቅም

5. ብላርዚያ ወንዝ ላይ ልብስ እና እቃ በማጠብ ሊይተላለፉ ይችላል

1. ይተላለፉል 2. አይተላለፍም 3. አላዉቅም

6. ብላርዚያ ወንዝ ላይ አሳ በማጥመድ ሊተላለፍ ይችላል

1. ይተላለፉል 2. አይተላለፍም 3. አላዉቅም

7. ብላርዚያን መከላከያ መንገዶች ምን ምን ናቸዉ

1. ወንዝ ላይ አለመዋኜት እና አለመታጠብ 2. በከሚካል ቀንድ አዉጣዎቸን መግደል

3. ወደ ጤና ተቋም በመሄድ መታከም 4. በባዶ እግር ወንዝ ማቋረጥ ማስወገድ

5. ወንዝን በድልድይ ማቋረጥ 6. አላዉቅም

8. የብላርዚያ ምልክቶች ምን ምን ናቸዉ----------

9. በአፈር ስለሚተላለፉ የሆድ ትላትሎች ሰምተዉ ያዉቃሉ

1. አዉቃለዉ 2. አላዉቅም

10. በተራ (ቁ.9) መልሰዎ አዉቃለዉ ከሆነ መረጃዉን ከየት አገኙት

1. ከመገናኛ ቡዙሀን 2. ከመፅሄት፣መጽሀፍ 3.ከጤና ተቁአማት 4. ከጎረቤት 5. ሌላ ካለ ይግለጹ

11. በአፈር የሚተላለፉ የሆድ ትላትሎች በቆሻሻ እጅ በመመገብ ሊተላለፍ ይችላሉ

1. ይተላለፉሉ 2. አይተላለፍም 3. አላዉቅም

12. በአፈር የሚተላለፉ የሆድ ትላትሎች ጫማ ባለመልበስ ሊተላለፉ ይችላሉ

1. ይተላለፉሉ 2. አይተላለፍም 3. አላዉቅም

13. በአፈር የሚተላለፉ የሆድ ትላትሎች ጥፍር በማሣደግ እና ንጽህናዉን ባለመጠበቅ ሊተላለፍ ይችላሉ

1. ይተላለፉሉ 2. አይተላለፍም 3. አላዉቅም

14. በአፈር የሚተላለፉ የሆድ ትላትሎች ከመጸዳጃ ቤት መልስ እጅ ባለመታጠብ ሊተላለፍ ይችላሉ

1. ይተላለፋሉ ☐ 2. አይተላለፍም ☐ 3. አላዉቅም ☐

15. በአፈር የሚተላለፉ የሆድ ትላትሎች ምግብ ከመመገብ በፊት እጅ ባለመታጠብ ሊተላለፍ ይችላሉ

1. ይተላለፋሉ ☐ 2. አይተላለፍም ☐ 3. አላዉቅም ☐

16. . በአፈር የሚተላለፉ የሆድ ትላትሎች ቆሻሻ ዉሃ በመጠጣት እና ያልታጠቡ ፍራፍሬ እና አትክልቶችን በመመገብ ሊተላለፍ ይችላሉ

1. ይተላለፋሉ ☐ 2. አይተላለፍም ☐ 3. አላዉቅም ☐

ክፍል አራት፡- ብላርዚያን እና በአፈር የሚተላለፉ የሆድ ትላትሎችን የተመለከተ የእናቶችን ተግባር፣ የሚዳስስ ጥያቄ

1. ህጻናትን ወደወንዝ ይወስዳሉ

1. እወስዳለው ☐ 2. አልወስድም ☐

2. ህጻናትን ወንዝ ላይ ያጥባሉ

1. አጥባለው ☐ 2. አላጥብም ☐

3. ህጻናትን ወንዝ ላይ ሲያጥቡ ሳሙና ይጠቀማሉ

1. እጠቀማለዉ ☐ 2. አልጠቀምም ☐

4. ህጻናትን ቤት ዉጥ ከወንዝ በተቀዳ አዲስ ወይም በቆየ ዉሃ ያጥባሉ

1. አጥባለው ☐ 2. አላጥብም ☐

5.ህጻናትን ወደ መስኖ በታ ይወስዳሉ

1. እወስዳለሁ ☐ 2. አልወስድም ☐

6. ህጻናትን ወንዝ ላይ ይዋኝአሉ

1. ይዋኝአሉ ☐ 2. አይዋኝም ☐

7. በተራ ቁጥር 6 ላይ መልሠዎ ይዋኝአሉ ኩሆነ በሣምንት ለምን ያህል ጊዜ ይዋኝአሉ

1. 0 ☐ 2. 1-2 ☐ 3. > 3 ☐

8. መጸዳጃ ቤት አለዎት

1. አለ ☐ 2. የለም ☐

9. መጸዳጃ ቤት በአግባቡ ይጠቀማሉ

1. እጠቀማለሁ ☐ 2. አልጠቀምም ☐

10.ከመጸዳጃ ቤት መልስ እጅ የመታጠብ ልምድ

1. አለ ☐ 2. የለም ☐

11. ምግብ ከመመገብ በፊት እጅ የመታጠብ ልምድ

1. አለ ☐ 2. የለም☐

12. በህጻናት ጥፍር ውስጥ ቆሻ

1. አለ ☐ 2. የለም ☐

13. ጫማ አለዎት

1. አለኝ ☐ 2. የለኝም ☐

14. ጫማ የመልበስ ልምድ

1. ሁልግዜ ☐ 2. አንዳንዴ ☐ አላደርግም ☐

15. ለአገልግሎት የሚውል ውሃ ከየት ያገኛሉ

1. የባንቦ ውሃ ☐ 2. የምንጭ ውሃ ☐ 3. ጉድጋድ ውሃ ☐

16. ያልታጠቡ ፍራፍሬዎችን እና አትክልቶችን የመመገብ ልመድ

1. አለ ☐ 2.የለም ☐

17.ህጻናት ሰገራ ላይ ደም ተመልክተዉ ያዉቃሉ

1. አዉቃለዉ ☐ 2. አላዉቅም ☐

18. በአፈር የሚተላለፉ የሆድ ትላትሎች በሽታ ምልክት ይጥቀሱ-_____

Annex III: sample collection form

1. Name of children ……
2. Age ……
3. Sex M …… F……
4. Code number ……..
5. Data which may be optional weight ……..(Kg)…..Height…….(cm)
6. Stool examination with wet mount result …….
7. Stool examination with Kato Katz

   Intensity of infection for *S. mansoni*(EPG)

   A. lumbricoides(EPG)

   T. trichiura(EPG)

   H. worms(EPG)

   Other parasite identified ……

8. Other remarks …….

Annex IV. Procedure for stool specimen collection and processing

A. Collection of stool specimen

1. Give for mothers of children a plastic cup or box with a tight fitting lid and two applicator sticks
2. Tell the patients to pass the stool specimen directly in to the container or to pass the stool on to a piece of paper and use the applicator stick to transfer it to the container
3. Amoebic trophozoites, will begin to disintegrate or change with a short time after passage so specimen should reach to laboratory within an hour of passage
4. The container with specimen should be labeled clearly with the following information
   - Children name or number
   - Date of collection
   - Time in which child passed the stool
5. The stool specimen must be large enough for satisfactory examination.

   .

B. Procedures of cellophane fecal thick smear for diagnosis of intestinal schistosomiasis (Kato Katz technique)

1. Soak the cellophane strips in the 50 % glycerol- malachite green (or methylene blue) solution for at least 24 hours before use
2. Transfer a small amount of feces in to a piece of scrap paper (news paper is ideal)
3. Press the screen on top of the fecal sample
4. Using a flat sided applicator stick, scrape across the upper surface of the screen to sieve the fecal sample.
5. Place a template on a clean microscope slide
6. Transfer a small amount of sieved fecal material in to the hole of the template and carefully fill the hole. Level with applicator stick
7. Remove the template carefully so that all the fecal material is left on the slide and none is left sticking to the template
8. Cover the fecal sample on the slide with a glycerol soaked cellophane strip
9. If an excess of glycerol is present on the upper surface of the cellophane, wipe off the excess with a small piece of toilet paper or absorbent tissue.
10. Invert the microscope slide and press the fecal sample against the cellophane on a smooth surface (a piece of tile or flat stone is ideal) to spread the sample evenly.
11. Do not lift the slide straight up, the cellophane may separate. Gently slide the microscope slide sideways holding the cellophane.

Declaration

The research work in this thesis entitled "Intestinal schistosomiasis, soil transmitted heilmentes and associated risk factors among preschool aged children of Chuahit and surrounding Kebeles, Northwest Ethiopia." Was carried out by me under the supervision of Mr AGERSEW ALEMU and Mrs DEMEKECH DAMITE in the College of Medicine and Health Sciences, School of Biomedical and Laboratory Sciences, Department of Medical Parasitology University of Gondar, for the award of MSc Degree in Medical Parasitology. I declare that this work is original and has not been submitted to any other University or institution.

Name Yalewayker Tegegne

Signature ----------

Place of submission: School of Biomedical and Laboratory sciences, College of Medicine and Health Sciences, University of Gondar.

Date of submission: ----------

This thesis has been submitted for examination with our approval as university advisors

Advisors

Name	Signature
1 Agersew Alemu (Bsc, Msc)	_____
2. Demekiche Damite (Bsc ,Msc)	_____

Examiner(s)

	Name	Signature
1. External examiner		_____
2. Internal examiner		_____